

Amendments to the Claims:

This listing of claims will replace all prior versions and listing of claims in the application.

Listing of Claims:

1. (currently amended) A bottom-to-surface connection device comprising at least one undersea pipe or riser ~~(1, 1a-1b)~~ including at least one float ~~and possibly including only one float (2, 2a-2c)~~, said at least one float being connected at its bottom end to a junction device (8) creating a leaktight flexible joint between the bottom end of the float (2) and said riser ~~(1a)~~, ~~the connection device being characterized in that~~ wherein said junction device (8) is interposed between and secured to a bottom portion ~~(1a)~~ of the riser going down to the sea bottom and a top portion ~~(1b)~~ of the riser passing through said float and rising to the surface, said junction device (8) comprising ~~at least~~:

- a first forged body of revolution ~~(22)~~ secured to the top end of said bottom portion ~~(1a)~~ of the riser, and forming an internal tubular duct section ~~(223)~~ having substantially the same diameter as said bottom portion of the riser; and

- a second forged body of revolution ~~(24)~~ secured to the bottom end of said top portion ~~(1b)~~ of the riser, and forming an internal tubular duct section ~~(24a)~~ having substantially the same diameter as said top portion ~~(1b)~~ of the riser;

- said first and second forged bodies ~~(22, 24)~~ being interconnected in flexible and leaktight manner by at least a first flange ~~(23)~~ in the form of a body of revolution secured in leaktight and reversible manner to said second forged body (24) and connected to said first forged body ~~(22)~~ by at least a first laminated abutment ~~(30)~~ in the form of a body of revolution,

comprising a plurality of elastomer layers interposed between rigid reinforcements ~~preferably made of metal~~ defining surfaces of revolution having the same axis as the common longitudinal axis of revolution ZZ' of said first and second forged bodies (22, 24) and said first flange (23, 23a-23b), said surfaces of revolution being frustoconical in shape or skew surfaces, ~~such as comprising~~ surfaces of sections that are ellipsoidal or parabolic or hyperbolic ~~or preferably spherical in shape.~~

2. (currently amended) [[A]] The bottom-to-surface connection device according to claim 1, comprising an undersea pipe or riser (1, 1a-1b) tensioned by at least one float (2, 2+, 2+) constituted by a can presenting a cylindrical casing (20) surrounding said pipe (1b) coaxially, located on the high underwater portion of said pipe (1, 1a-1b), said pipe (1, 1a, 1b) ~~preferably being held and guided by a surface guide device (4, 6) located at a floating support (10) and including a said junction device (8) for said can (20), the connection device being characterized in that~~ wherein:

[[-]] said first forged body (22) presents in its top portion an outer first surface of revolution (22+) that is ~~preferably one of~~ frustoconical in shape ~~or and~~ of ellipsoidal section; and

- said second forged body of revolution (24) secured to the bottom end of said top portion (1b) of the riser, ~~preferably by welding (24a)~~, presents in its bottom portion a bottom first surface (24k); and

[[-]] said first flange (23, 23a-23b) presents:

[[•]] an inner first surface of revolution (23+) of one of frustoconical shape ~~or and~~ of ellipsoidal section, said inner first surface (23+) of the first flange (23, 23a-23b) and said outer first surface (22+) of the first forged body (22) being situated facing each other and co-operating

elastically and in leaktight manner via ~~[[a]]~~ said first laminated abutment (30) in the form of a body of revolution that is one of frustoconical in shape ~~or respectively~~ and of ellipsoidal section, comprising a plurality of layers of elastomer sandwiched between rigid steel reinforcing sheets ~~of rigid material, in particular steel sheets~~, bonded to said inner first surface (23₁) and said outer first surface (22₁) thus bonding together said first flange (23, 23a-23b) and said first forged body (22); and

~~[[•]]~~ at least a portion of a top surface (23₂) of said first flange (23, 23a-23b) co-operating in leaktight manner, ~~preferably via at least one O-ring (28)~~, with said bottom surface (24₁) of said second forged body of revolution (24), said top surface portion (23₂) of said first flange (23, 23a-23b) and said top surface (24₁) of said second forged body (24) being secured to each other in leaktight and reversible manner, ~~preferably by bolting (27)~~; and

~~[[-]]~~ said outer casing (20) of the float (2) being secured to one of a top surface (24₂) of said second forged body (24) ~~or to~~ and a top surface (21₁) of a second flange (21) in the form of a body of revolution having a bottom surface (21₂), itself bonded in leaktight and reversible manner, ~~preferably by bolting (25) and~~ via at least one O-ring (26), to a portion of said top surface of revolution (23₂) of said first flange (23, 23a-23b).

3. (currently amended) ~~[[A]]~~ The device according to claim 1 ~~or claim 2~~, ~~characterized in that~~ wherein said second forged body of revolution (24) includes in its bottom portion an outer second surface (24₂) of one of frustoconical shape ~~or preferably of~~ ellipsoidal section, and said outer second surface of revolution (24₂) is situated facing and co-operates elastically and in leaktight manner with an inner second surface of revolution (22₂) of one of frustoconical shape ~~or respectively of~~ and ellipsoidal section, said inner second surface (22₂)

being situated in the top portion of said second forged body (22), and said inner second surface (22₂) being connected to said outer second surface (24₃) via a second laminated abutment (31) in the form of a body of revolution constituted by a plurality of elastomer layers sandwiched between rigid reinforcing sheets, ~~in particular of steel~~, that are one of frustoconical in shape ~~or respectively of~~ and ellipsoidal section, and that are bonded to said outer second surface (24₃) and to said inner second surface (22₂).

4. (currently amended) [[A]] The device according to claim 2 ~~or claim 3~~, characterized in that wherein said first abutment (30) ~~and where appropriate said second abutment (31)~~, said outer first surface (22₁) of the first forged body (22), and said inner first surface (23₁) of the first flange (23, 23a-23b), ~~and, where appropriate said outer second surface of revolution (24₃) of the second forged body (24), and said inner second surface of revolution (22₂) of the first forged body (22)~~ are all frustoconical in shape about the same said axis of revolution ZZ', with an angle of the apex β lying in the range 30° to 80°, ~~preferably in the range 40° to 70°~~, the apexes of the various frustoconical surfaces being situated below said frustoconical surfaces, and the various frustoconical surfaces ~~either sharing~~ one of a common angle at the apex β ~~or~~ and a common apex C.

5. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 1 to 3, characterized in that wherein said first abutment (30), ~~and, where appropriate said second abutment (31)~~, said outer first surface (22₁) of the first forged body (22), said inner first surface (23₁) of the first flange (23, 23a-23b), ~~and, where appropriate said outer second surface of revolution (24₃) of the second forged body (24), and said inner second surface of revolution (22₂)~~

of the first forged body (22) ~~are all~~ is of ellipsoidal section, ~~preferably of spherical section, all~~
~~being~~ substantially centered on the ~~common~~ point O situated above said ~~surfaces~~ surface and on
said axis of revolution ZZ'

6. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 1 to
5, ~~characterized in that~~ wherein said first and second forged bodies (22, 24) and said first flange
(23, 23a-23b) define a first internal chamber (40) which ~~preferably~~ co-operates with pressure
sensor means (41, 42) for monitoring the pressure inside said chamber (40).

7. (currently amended) [[A]] The device according to claim 6, ~~characterized in that~~
wherein said first internal chamber (40) is defined by the top portion of said first forged body
(22) and by the free portions of said a bottom surface of revolution (24₁) of said second forged
body (24), said ~~concave~~ inner first surface of revolution (23₁) of said first flange (23, 23a-23b),
and said ~~convex~~ outer second surface of revolution (24₂) of said second forged body (24).

8. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 2 to
7, ~~characterized in that~~ wherein said outer casing (20) of the float (2) is secured to an internal
second pipe (3) of greater diameter than said riser (1, 1b), ~~said internal second pipe (3) preferably~~
~~being a reinforced pipe of thickness greater than said riser (1), and in that it~~ and wherein the
device includes [[a]] said second flange (21) in the form of a body of revolution to which the
bottom end of said outer casing (20) of the float (2) and the bottom end of said internal second
pipe (3) are secured, ~~preferably~~ by welding (21a, 21b), said second flange (21) surrounding said
second forged body (24) so that a second inner chamber (45) is defined by an inner surface of

revolution (21₂) of said second flange (21) having the same axis of revolution ZZ', by said top surface of revolution (24₂) of said second forged body (24), by the cylindrical outer surface (4₁) of said top portion (4b) of the riser and the cylindrical inside surface (3₁) of said internal second pipe (3), and by a closure flange (5) at the top ends of said internal second pipe (3) and of said top portion (4b) of the riser, ~~said second chamber (45) preferably co-operating with means for monitoring the pressure (47, 48) inside said second chamber (45).~~

9. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 2 to 8, ~~characterized in that~~ wherein said top surface peripheral (23₂) of the first flange (23, 23a-23b) and said bottom surface (24₁) of the second forged body (24), ~~and where appropriate said bottom surface (21₂) of said second flange (21),~~ are annular plane surfaces.

10. (currently amended) [[A]] The device according to claim 8 ~~or claim 9~~, ~~characterized in that~~ wherein said internal second pipe (3) extends above said float (2), ~~preferably in the form of a reinforced pipe of thickness greater than said riser (1) which it surrounds,~~ and ~~preferably~~ a holding and guide device (4, 6) serves to guide said internal second pipe (3) relative to said floating support (10).

11. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 1 to 10, ~~characterized in that~~ wherein the top end of the float (2) is secured to one of the top portion (4b) of the riser (1) ~~or of~~ and said internal second pipe (3) via a rigid junction (8₁).

12. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 1 to

11, ~~characterized in that~~ wherein said float (2) is a single float extending over a length of approximately 40 m to approximately 100 m in order to confer buoyancy enabling substantially the entire bottom-to-surface connection to be tensioned, ~~said float (2) preferably being made up of segments that are assembled to one another, each being constituted by a cylindrical box, which boxes are preferably individually sealed (2k, 2.9, and secured mechanically to one another in the longitudinal direction ZZ'.~~

13. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 1 to 11, ~~characterized in that~~ wherein the buoyancy of said undersea pipe (1) is provided by said float without adding any additional tensioning system that is secured to the floating support (10).

14. (currently amended) [[A]] The device according to ~~any one of claims~~ claim 1 to 13, ~~characterized in that it includes~~ further comprising stabilizer means (60, 61) in the bottom portion (27) of the float (2) ~~having the effect of~~ for at least one of increasing the mass of water it the device entrains when it moves, ~~or~~ and lowering the center of gravity of the top portion of the pipe in the float (2).

15. (currently amended) [[A]] The device according to claim 14, ~~characterized in that a~~ wherein said stabilizer means comprise a helical ramp (61) surrounding the bottom portion (27) of said float (2) close to its bottom end.

16. (currently amended) [[A]] The device according to claim 14, ~~characterized in that a~~ wherein said stabilizer means comprises an additional peripheral mass (60) situated around

the bottom portion (27) of the float (2).

17. (currently amended) [[A]] The device according to ~~any preceding~~ claim 1, ~~characterized in that~~ wherein said first flange (23) comprises two portions (23a—23b) in which the first portion (23a) is a body of revolution including said inner first surface (23₁), and said second portion (23b) is a peripheral flange including ~~said~~ a top surface of said first flange (23₂), said second portion (23b) being secured in leaktight and reversible manner to said first portion (23a) via at least one O-ring (29) by securing in leaktight and reversible manner said top surface ~~peripheral (23₂)~~ of the first flange (23) to ~~said~~ a bottom surface (24₁) of said forged second body (24).